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Grazing Management Based on ... How Grasses Grow

Lyle A. Derscheid

Walter N. Parmeter

Raymond A. Moore

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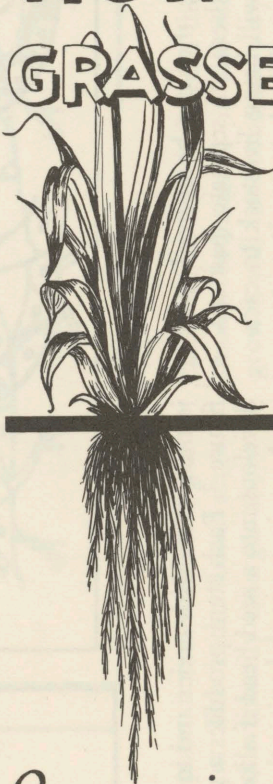
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Grazing Management based on . . .

HOW GRASSES GROW



LEAVES:

FOOD FACTORIES

short tops —
mean short roots



ROOTS:

GATHER and STORE FOOD

short roots —
mean short tops

*Overgrazing destroys
both leaves and roots*

Cooperative Extension Service
SOUTH DAKOTA STATE UNIVERSITY
Brookings, South Dakota

Grazing Management Based On . . .

Figure 1

HOW GRASSES GROW

95%
OF PLANT
FOOD IS
TAKEN
FROM
THE
AIR



LEAVES ARE FOOD FACTORIES

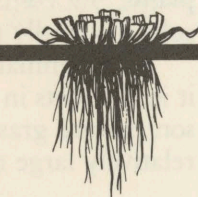
In the presence of sunshine, they combine carbon dioxide from the air and water, nitrates, and minerals from the soil to make plant food.

SHORT TOPS MEAN SHORT ROOTS!

5%
OF PLANT
FOOD IS
TAKEN
FROM
THE
SOIL

ROOTS gather raw materials; water, nitrates and minerals which are converted into plant food by the leaves. Roots also serve as storehouses for food. This food is essential for regrowth.

SHORT ROOTS MEAN LESS FUTURE GRASS PRODUCTION!



***OVERGRAZING WILL DESTROY BOTH
THE LEAVES AND THE ROOTS!***

By Lyle A. Derscheid, Extension Agronomist; Walter N. Parmeter, Conservation Agronomist, SCS; and Raymond A. Moore, Associate Professor of Agronomy.

How overgrazing removes the food factory (leaves) and depletes root reserves, resulting in a plant's poor root growth and low forage production, is shown in figure 1.

To get maximum production out of pastures, grasses must be managed properly. Proper grazing or clipping management (cutting for hay) is based on how grasses grow.

Much of South Dakota's 28 million acres of grassland has been mismanaged. Over 12 million acres of native grass is either in only poor or fair condition. Likewise, a vast majority of the tame pastures are badly overgrazed.

HOW GRASSES GROW

Grasses, like all green plants, live and grow on food manufactured primarily in their own green leaves. Carbon dioxide from the air enters the leaves through small pores (stomates). At the same time

water moves from the soil into the roots and upwards inside the plant. The green chlorophyll in the leaves and stems absorbs sunlight which furnishes the energy to manufacture carbohydrates (starches, sugars) from the carbon dioxide and water. Other nutrients (nitrogen, phosphorous, potassium) are absorbed, primarily from the soil. Plants combine these elements with the carbohydrates, already manufactured in the plant, to produce proteins, fats and oils. A certain amount of plant food is needed for growth by the plant. Any surplus food moves down the stems and is stored in the roots as root reserves.

Since leaves absorb raw materials and manufacture food, plants must be permitted to retain sufficient leaf area to carry out these functions. Normally grass is most efficient at producing food when it has all of its leaves—but grass is grown in pastures for grazing. Therefore, a certain percentage of the leaves must be removed. Grasses must be allowed, however, to retain enough leaves, so that they can absorb carbon dioxide and sunshine and produce enough food to maintain healthy vigorous roots.

Look at figure 2 and note how root reserves are used by plants and how over-grazing depletes them:

- (a) roots have a good supply of food;
- (b) some of these root reserves are used to produce top growth (leaves and stems);
- (c) when top growth is allowed to develop, it will manufacture more food, but if it is removed by mowing or grazing the food factory is gone;
- (d) if top growth is allowed to develop, root reserves are replenished, but if removed too soon more reserves are used for production of new growth;
- (e) proper management results in a plant with a good supply of root reserves and further development of root system, while overgrazing reduces the food supplies;
- (f) further root development and maintenance of root reserves results in a thicker stand of vigorous plants, but continuous reduction of root reserves results in spindly top growth and weak roots.

All perennial grasses produce plant food and store it in the roots in much the same way. That is the reason pasture grasses should be allowed to maintain a relatively large root reserve. This is essential to max-

imum forage production during the grazing season, and aids the grass in surviving the winter and starting vigorous growth early the next season.

GROWTH CHARACTERISTICS

Growth characteristics, such as type of growth, season of growth, type of root system and morphology of the plant, must be considered when deciding how to use grasses most efficiently.

Season of Growth

All grasses do not start growth at the same time. Crested wheatgrass, Russian wildrye, and bluegrass start growth early in the spring. Smooth brome grass, intermediate wheatgrass and others soon follow. Cool-season natives (needlegrasses, western wheatgrass and others) start somewhat later, but before the warm-season grasses (switchgrass, Indiangrass, bluestems and others) which do not start growth until late in the spring. Since grasses must produce a certain amount of growth before being grazed, they are not ready for grazing or mowing at the same time. If later-emerging grasses are mixed with earlier grasses and are grazed when the earlier grasses are ready, the root reserves of the later grasses will be reduced. They will not give maximum forage production and may not even survive. Since all grasses are not ready for

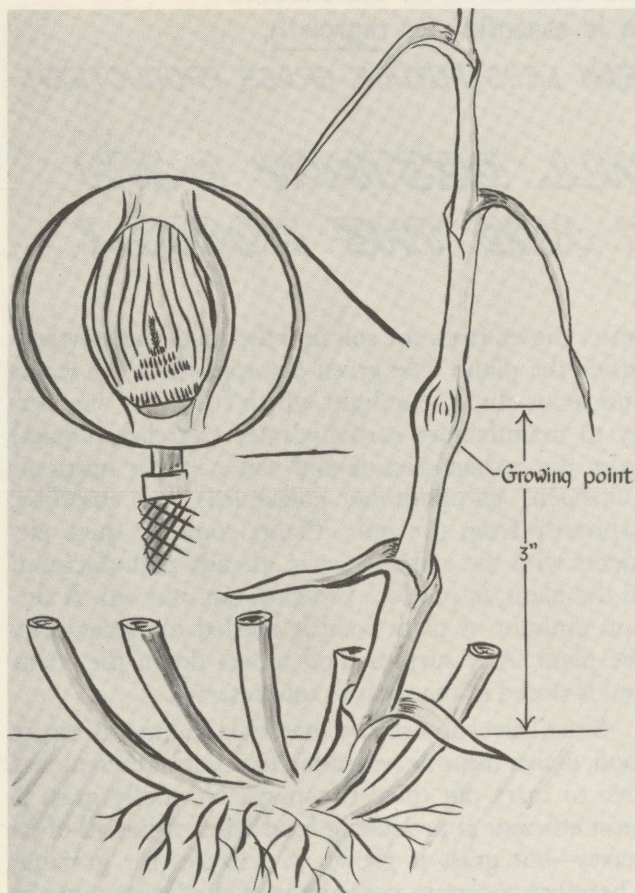


Figure 3. Grass with jointed stems showing location of growing point shortly before boot stage of growth. (Courtesy of M. R. Teel, Purdue University.)

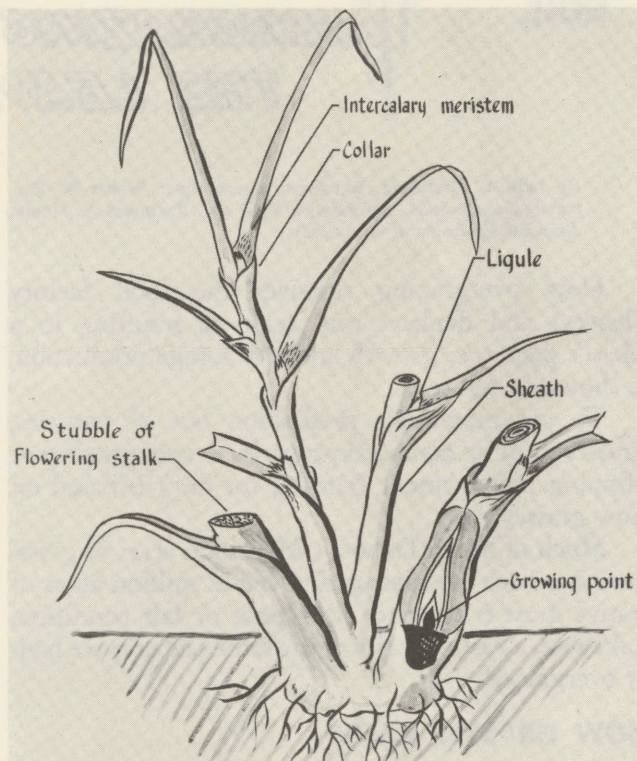
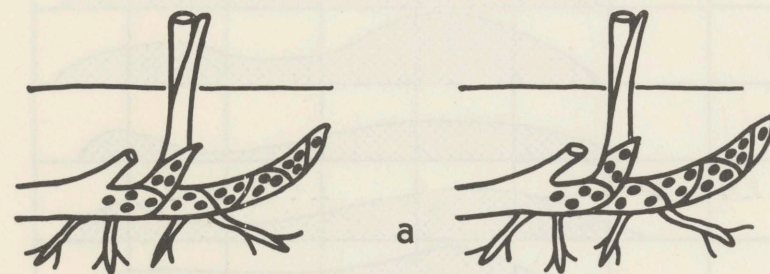


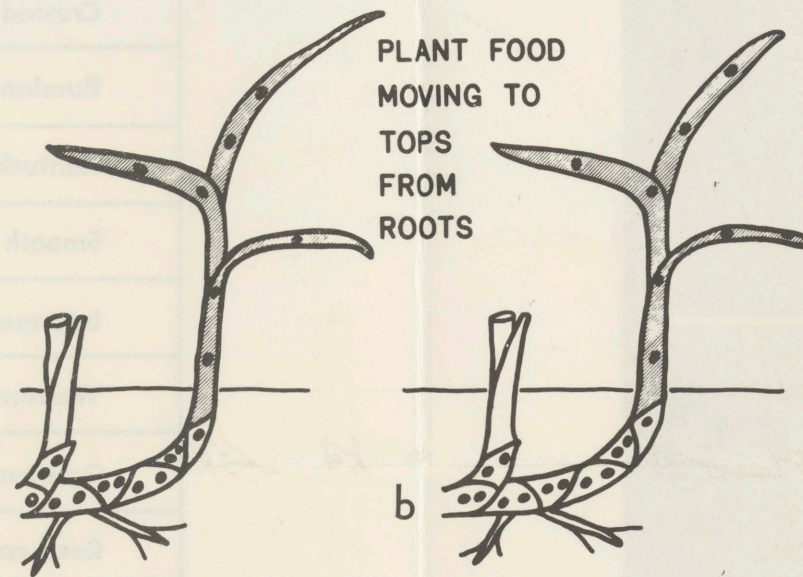
Figure 4. Grass with growing point at base of stem. (Courtesy of M. R. Teel, Purdue University.)

Figure 2

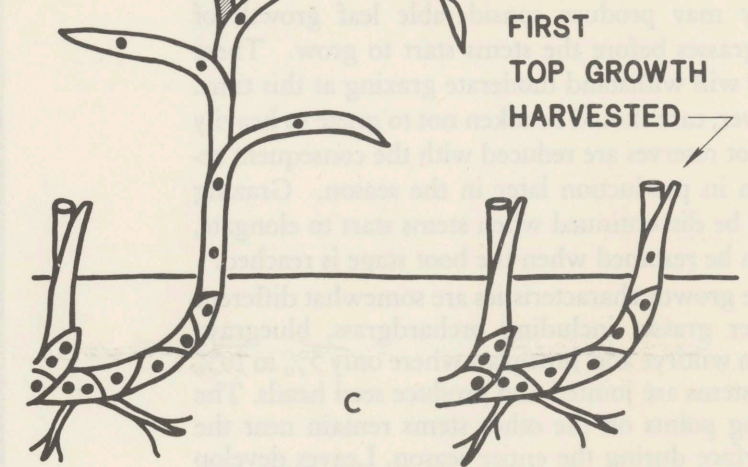
DIAGRAMMATIC SKETCH OF TWO PERENNIAL GRASS PLANTS IN DORMANT STAGE



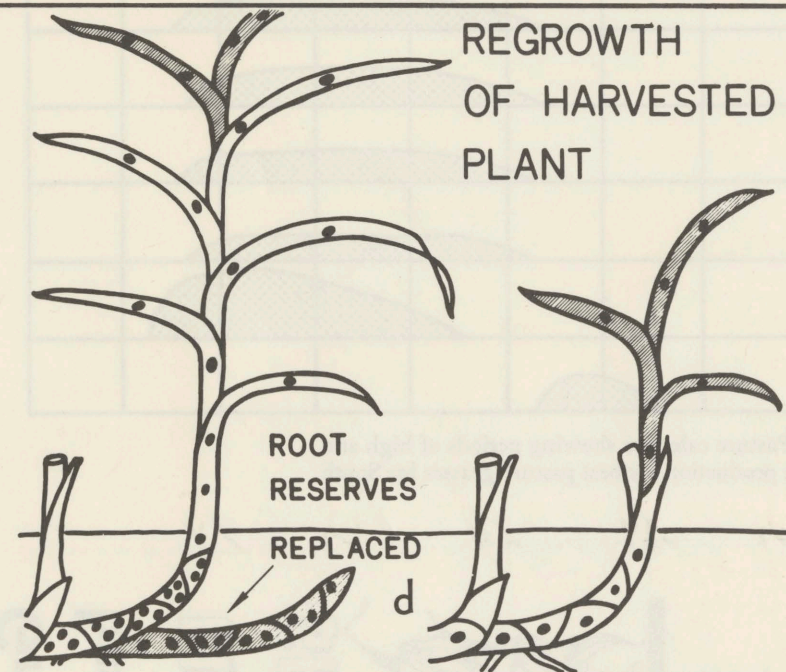
TOP GROWTH STARTED



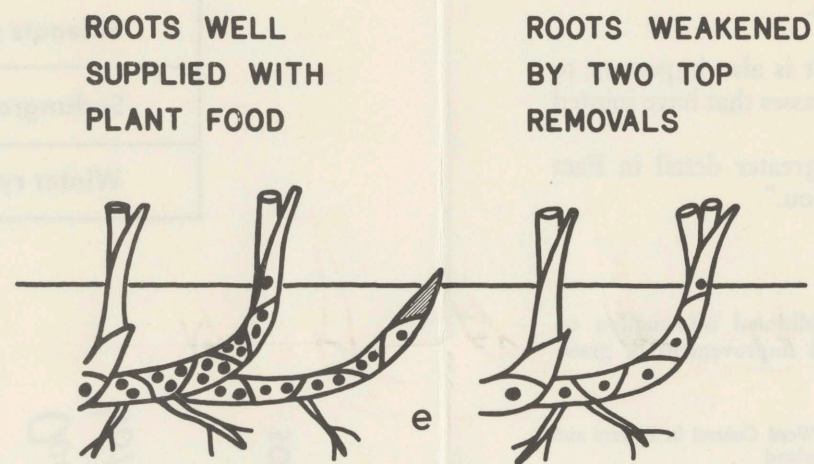
CONTINUED TOP GROWTH



REGROWTH OF HARVESTED PLANT

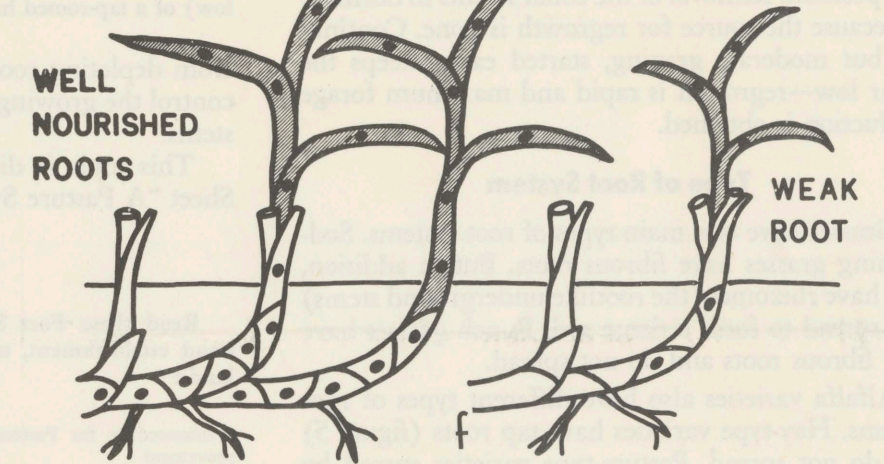


BOTH PLANTS HARVESTED



TWO VIGOROUS STEMS

SPINDLY TOP



(Figures 1 and 2 courtesy
USDA, SCS)

grazing at the same time, they can be utilized most efficiently by planting them in separate pastures. Proper pasture rotation will bring livestock to each pasture when the grass is ready to be grazed.

Structural Development

In several grass species the *growing point* in the stems hold one of the keys to proper pasture management and maximum forage production.

Smooth brome grass and several wheatgrasses have

jointed stems with nodes and internodes as shown in figure 3. Each stem produces a growing point which develops into a seed head if allowed to mature.

As spring growth begins, the growing point is inside the stem near the surface of the soil. This growing point stays above the upper joint near the top of the plant. As the season progresses, the growing point gets farther above the soil surface. Each leaf develops from it. After all the leaves have been formed, the growing point produces the seed head. As this seed

head enlarges inside the plant, it causes a swelling of the upper part of the plant. This is the "boot" stage of growth. The seed head eventually emerges above the top leaf and matures.

The growing point controls the growth of the plant. If it is removed by grazing or mowing *before* the plant has reached the boot stage, its stem will go dormant and regrowth from the base of the stem will be slow. If it is removed *after* the plant reaches the boot stage, it triggers a regrowth mechanism. This

causes rapid regrowth from the base of the plant. If smooth brome grass is allowed to "head-out", regrowth will not occur and very little vegetation will be produced until the seed is fully mature.

Under normal conditions proper use of brome grass, intermediate wheatgrass and others with jointed stems, includes rotational grazing. The best management practice is to graze half the pasture and mow the other half for hay when the grass is in the boot stage of growth. Removal of the growing points will

stimulate regrowth. In 10 to 14 days the mowed half of the pasture will be ready to graze. With smooth brome grass, seed heads should be clipped from the grazed half to remove growing points not removed by grazing. This stimulates regrowth from all stems.

Under some conditions adequate moisture and fertility may produce considerable leaf growth of these grasses before the stems start to grow. These grasses will withstand moderate grazing at this time. However, care should be taken not to graze so heavily that root reserves are reduced with the consequent reduction in production later in the season. Grazing should be discontinued when stems start to elongate, but can be resumed when the boot stage is reached.

The growth characteristics are somewhat different in other grasses including orchardgrass, bluegrass, Russian wildrye and Junegrass where only 5% to 10% of the stems are jointed and produce seed heads. The growing points on the other stems remain near the soil surface during the entire season. Leaves develop from these lower growing points, but forage production comes from continued leaf growth at the junction of the blade and sheath—the collar (figure 4). Continued removal of leaves by grazing or mowing stimulates rapid regrowth of leaves and maximum forage production. Deferred grazing permits the sheath to grow too high thereby raising the collar to a vulnerable position. Removal of the collar results in dormancy because the source for regrowth is gone. Continuous but moderate grazing, started early, keeps the collar low—regrowth is rapid and maximum forage production is obtained.

Type of Root System

Grasses have two main types of root systems. Sod-forming grasses have fibrous roots. But in addition, they have rhizomes (the rootlike underground stems) that spread to form a dense sod. Bunch grasses have only fibrous roots and do not spread.

Alfalfa varieties also have different types of root systems. Hay-type varieties have tap roots (figure 5) and do not spread. Pasture-type varieties spread by means of underground parts—Teton spreads from the crown, but Rambler and Travois have proliferating roots (figure 5). Pasture-type alfalfas spread much the same as sod-forming grasses.

MANAGEMENT

Proper use of grass requires pasture rotation and rotation grazing. It is essential to rotate from one pasture to another to graze grass species during their most productive periods of growth and allow them to replenish root reserves during other periods. Likewise, rotation grazing within a pasture is necessary to keep

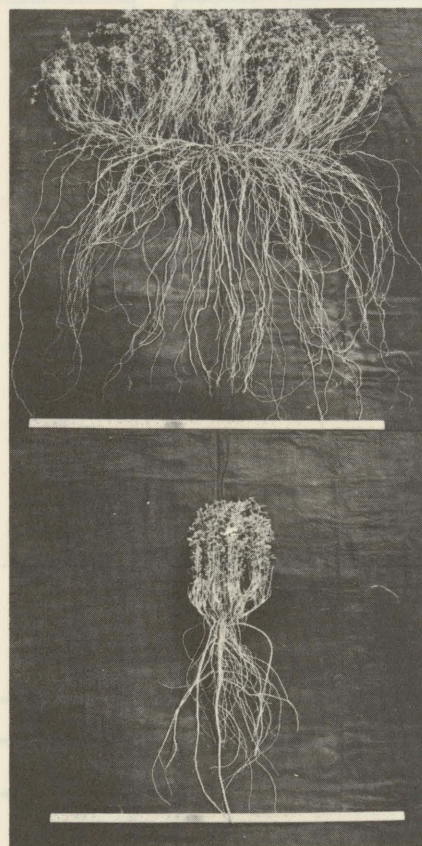


Figure 5. Proliferating root system (upper) typical of Travois, a pasture-type alfalfa, in contrast to the root system (below) of a tap-rooted hay-type alfalfa.

from depleting root reserves. It is also important to control the growing point in grasses that have jointed stems.

This topic is discussed in greater detail in Fact Sheet "A Pasture System for You."

Read these Fact Sheets for additional information on stand establishment, utilization and improvement of grasslands:

Interseeding for Pasture Improvement
Planting Tame Pasture and Hayland
Tame Grasses for Pasture and Hayland
Native Grasses for Pasture and Hayland
A Pasture System For You
Fertilizing Pasture and Hayland

Weed Control in Pasture and Hayland
South Dakota Range—Its Nature and Use
"Proper" Range Use
Reseed Native Range Grass? or Plant a Tame Pasture?
Range Seedings
Graze Longer and Feed Less Roughage
My Rangelands — What Kinds? How Good?

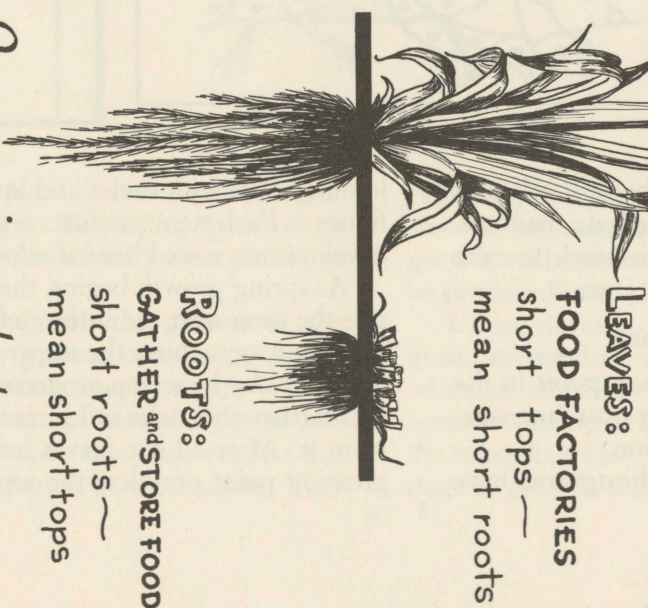
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Grazing Management based on . . .

HOW

GRASSES GROW



*Overgrazing destroys
both leaves and roots*

PASTURE/RANGE CROP	Apr.	May	June	July	Aug.	Sept.	Oct.
Crested wheatgrass							
Russian wildrye							
Kentucky bluegrass							
Smooth brome							
Intermediate wheatgrass							
Western wheatgrass							
Green needlegrass							
Reed canarygrass							
Switchgrass							
Indiangrass							
Bluestems							
Sideoats grama							
Sudangrass							
Winter rye							

Figure 6. Pasture calendar showing periods of high and low forage production for best pasture grasses for South Dakota.